REMARKS/ARGUMENTS

This is in response to the Office Action dated November 15, 2004, and the telephonic interview held with the Examiner on February 10, 2005. The substance of the interview is set forth below.

During the interview, the Examiner indicated that he may be willing to withdraw the current rejection if evidence was provided showing that there is no anodic oxidation in Mitsui on the bottom side of the aluminum pixel electrode. In particular, the Examiner asked if the applicant could provide him with a Rule 132 declaration stating that there is no anodic oxidation in Mitsui on the bottom side of the aluminum pixel electrode (both between the pixel electrode and the drain electrode 37, and between the pixel electrode and the organic interlayer insulator). *The requested Rule 132 declaration is attached hereto*, evidencing that there is no such anodic oxidation problem in Mitsui. Thus, the basis for the alleged Section 103(a) combination of Mitsui and Lee has been shown to be fundamentally flawed since the only reason that the Office Action contends that it would have been obvious is to have prevented anodic oxidation on the bottom side of Mitsui's aluminum pixel electrode.

General

For purposes of example, and without limitation, certain example embodiments of this invention relate to a technique for *improving adherence of a reflective pixel electrode in a liquid crystal display (LCD) to an underlying insulating layer.* As shown in Fig. 2A of the instant specification for example, the LCD includes a TFT 43, interlayer insulating film 44, molybdenum nitride (MoN) inclusive film 45 and conductive reflective pixel electrode 46 (e.g., made of Al) which defines at least part of a pixel of the LCD. The reflective pixel electrode 46

is in electrical communication with a drain 54 of the TFT via contact hole 66 defined in the interlayer insulating film 44.

Unexpectedly, it has been found that the use of MoN in layer 45 provides improved adhesion between the reflective pixel electrode 46 and interlayer insulator 44 thereby resulting in better yields, improved durability, and/or the like. Unexpectedly, reduction of electrolytic corrosion is also achieved due to the MoN under the reflective LCD pixel electrode. Thus, the use of MoN in layer 45 is advantageous in an unexpected manner for a number of reasons.

Claim 1

Claim 1 stands rejected under 35 U.S.C. Section 103(a) as being allegedly unpatentable over Mitsui in view of Lee. This Section 103(a) rejection is respectfully traversed for at least the following reasons.

Claim 1 requires "a film comprising molybdenum nitride formed immediately below and in contact with the reflective pixel electrode, and above and contacting the interlayer insulator, so that the molybdenum nitride is at least partially located between and contacting each of the reflective pixel electrode and the interlayer insulator so that a bottom surface of the molybdenum nitride is located over and contacting a top surface of the interlayer insulator and a top surface of the molybdenum nitride is located under and contacting the reflective pixel electrode." The cited art fails to disclose or suggest these aspects of claim 1.

The Section 103 rejection of claim 1 is incorrect for at least the following three separate and distinct reasons.

First, the Office Action appears to have misinterpreted Lee. The Office Action contends that Lee discloses a molybdenum nitride barrier layer 49 over the gate electrode. However, in contrast to the Office Action's contention, Lee does not disclose such a layer. While Lee states

that a variety of different metals such as Cr, Ta, Mo, Ti, Al, Ni, Pd, Au, Ag, Co, Zr, etc. may be used for barrier layer 49 when the barrier layer is to be a metal, Lee never mentions molybdenum nitride (e.g., col. 7, lines 20-35). The only nitride mentioned by Lee is silicon nitride, which clearly is not molybdenum nitride (col. 7, lines 34-36). Thus, since Lee fails to even disclose a molybdenum nitride barrier layer 49, the alleged Section 103(a) rejection is fatally flawed. Accordingly, even if layer 49 of Lee were used in Mitsui as alleged in the Office Action, the invention of claim 1 still would not be met since the alleged combination still would not have the claimed layer comprising molybdenum nitride.

Second, the reason Lee uses Mo for barrier layer 49 is to prevent anodic oxidation of the *underlying* gate electrode 45 (col. 8, lines 23-27). There is no teaching in Mitsui that there is an anodic oxidation problem with the bottom surface of the pixel electrode – thus, there is no reason why one of ordinary skill in the art would ever have provided a Mo layer in the location alleged by the Office Action. This is especially true since there can be no anodic oxidation problem with the pixel electrode in Mitsui due to the presence of the organic insulation film 42 below the pixel electrode. *The Rule 132 declaration attached hereto evidences that there is no anodic oxidation problem in Mitsui on the bottom of the pixel electrode.* Again, since there is no anodic oxidation problem in Mitsui, there is absolutely no reason in the art of record which would have led one of ordinary skill in the art to have provided a Mo layer below the pixel electrode of Mitsui as alleged in the Office Action.

Third, if one of ordinary skill in the art were to use Lee's Mo layer 49 in Mitsui, one would have located it in a position as taught by Lee (i.e., directly over and contacting the gate electrode). If this were done in Mitsui, the Mo layer would be in a similar location directly over the gate electrode, and the invention of claim 1 still would not be met.

For at least the three foregoing reasons, the Section 103(a) rejection of claim 1 is incorrect and should be withdrawn.

Claim 7 requires that "the laminated layer comprises an insulating film and a film comprising molybdenum nitride laminated to and over at least part of the insulating film, so that the molybdenum nitride contacts an upper surface of the insulating film; and a reflective metal film having a light reflecting function and provided in at least one pixel region of the display for contributing to displaying of images in the display, wherein the reflective metal film is formed on the laminated layer so as to contact the molybdenum nitride." The cited art fails to disclose or suggest these aspects of claim 7.

Claim 11 requires "a film comprising molybdenum nitride in direct contact with the under-side of said reflective pixel electrode, so that the molybdenum nitride of said film comprising molybdenum nitride is in direct contact with both (a) the under-side of the reflective pixel electrode and (b) an upper surface of the insulating layer." The cited art fails to disclose or suggest these aspects of claim 11.

For at least the foregoing reasons, it is respectfully requested that all rejections be withdrawn. All claims are in condition for allowance. If any minor matter remains to be resolved, the Examiner is invited to telephone the undersigned with regard to the same.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of

KOKURA et al — Atty. Ref.: 925-165; Confirmation No.

Appl. No. 09/696,220 — TC/A.U. 1772

Filed: October 26, 2000 — Examiner: Aughenbaugh, Walter

For: PATTERNED SUBSTRATE AND LIQUID CRYSTAL DISPLAY PROVIDED THEREWITH

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March 15, 2005

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

RULE 132 DECLARATION OF M. KOKURA

I, Masafumi Kokura, hereby declare as follows.

1. I am an inventor of the instant patent application, and am currently employed by Sharp Corporation (Sharp Kabushiki Kaisha), the assignee of the instant application.

2. I have been employed by Sharp Corporation since April of 1994. I worked in operations of TFT array processes for a-Si TFT LCDs from July of 1994 until September of 2002.

3. I graduated from the masters course in the Department of Materials Engineering of the NAGOYA INSTITUTE OF TECHNOLOGY, Aichi prefecture, Japan.

4. I am familiar with the above-listed patent application, for which I am an inventor. I have also reviewed and am familiar with U.S. Patent No. 5,408,345 to Mitsui.

5. In Mitsui (U.S. Patent No. 5,408,345), there is no anodic oxidation on the bottom side of the aluminum reflective pixel electrode 38. In particular, there is no anodic oxidation on the bottom side of pixel electrode 38 in Mitsui, either in the contact hole over the drain or over the organic insulating film 42.

6. Furthermore, an LCD would not function properly if there was tangible anodic oxidation on the bottom side of a pixel electrode, between the pixel electrode and drain. This is because good electrical contact could not be made between the pixel electrode and the drain, which is required for proper LCD operation. This further emphasizes that there is no tangible oxide on the bottom side of pixel electrode 38 in Mitsui, either in the contact hole over the drain or over the organic insulating film 42.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Respectfully submitted,

By: Masafumi Kokura
Masafumi Kokura